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COMPUTER-ASSISTED INSTRUCTION FOR ELEMENTARY ACCOUNTING

James C. McKeown

#190

College of Commerce and Business Administration
University of Illinois at Urbana-Champaign

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James C. McKeown

Associate Professor of Accountancy

University of Illinois at Urbana-Champaign

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Computer-Assisted-Instruction for Elementary Accounting

James C. McKeown

University of Illinoi at Urbana-Champaign

Computer-assisted-instruction (CAI) materials for a two-semester elementary accounting course are being developed at the University of Illinois at Urbana-Champaign. The intent of the present paper is to report the existence and progress of this project (in hopes of focussing some consideration upon this instructional medium which has a potential for great effectiveness in accounting education and avoiding unnecessary duplication of costly effort in this area[1]) and to present the results of a controlled experiment conducted during the Fall, 1973 semester using the completed[2] materials developed for the first semester (financial) accounting principles course. The paper will present discussion of objectives of the project, the CAI system used, the approach taken, and experience to date in achievement of objectives.

The objectives of the project (started in June, 1972) included:

I. Improvement of the instruction in the elementary accounting sequence at the University of Illinois. Improvement is expected in a combination of the following ways:

A) Better student absorption and retention of material currently presented in the elementary sequence. Advantages to the student which might help in achieving this result include:

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[1]Just how costly this particular effort was will be described later in the paper.

[2]The word "completed" here is used to indicate "available for regular classroom use." One of the major advantages of the materials developed in this project is their adaptability to improvement. Therefore, it is expected that many modules now being used will be modified in the future as experience in their use grows.

(1) Clearer presentation of material. Each student should get the clearest possible presentation of material since a greater amount of time and effort can be devoted to the development of presentations for use by thousands of students than can be afforded by an individual instructor who is preparing to present materials to a class of twenty or thirty or even a large lecture of several hundred. This development effort in a CAI system can include more detailed testing of materials which can be used as an important aid in improving presentation. Once a successful presentation has been developed, it is available to all students rather than the select few lucky enough to be assigned to a class taught by the best instructor.

(2) Less frustration experienced by the student since immediate help is available. Unfortunately, it is not uncommon for a student to be completely at a loss for a way to approach a homework problem. This student, if he is conscientious, will probably experience considerable frustration while attempting to solve the problem. He will eventually give up in disgust and wait until the next class to learn how to approach the problem (but probably be unable to absorb the rest of the solution since he has not had time to think through a correct approach), get help from a friend (who probably doesn't give as clear an explanation as could be given by the instructor--possibly through CAI), copy the solution from a friend, or think about it long enough to put together an acceptable solution. Even though the last alternative may build character, it can be a fairly discouraging experience for a student. If this student is doing his homework at a CAI terminal and he cannot approach the solution to a problem, help can be made available at a point selected by the instructor. This help is a clear, well thought-out explanation of one (or more) correct approach(es) to the problem. Once the student has absorbed the approach, he can then attempt to complete the solution and will be better able to benefit from the explanation of later steps. The computer can be

as patient as the most patient instructor in waiting for a student to absorb material and in presenting material as many times as requested.

The availability of immediate help should also greatly aid in the more common but somewhat less critical cases of students who are unable to carry out some part of the solution.

(3) Individually paced instruction. When presenting material (e.g., a problem solution) to a class, an instructor must attempt to hit a "happy medium" as to the amount of explanation needed by the students in the class. This means that those students who have learned the material and solved the problem quickly and easily must listen to explanations which are not necessary for them (or cut class) while students who had difficulty do not receive adequate explanation. Use of a CAI system allows the latter group to receive a much greater amount of instruction without holding back the student who does not need the additional explanation. Assuming that the students who need the additional explanation obtain it (either in class, the instructor's office, or elsewhere), the average student time required should decrease because the student who is having little or no difficulty is not even held back to the class "happy medium."

B) Less average time per student required to achieve an equal or better level of learning than that achieved by conventional methods.

C) Less instructor time required per student while maintaining or improving student learning. The instructor should save time which he would spend preparing and presenting solutions to homework problems as well as a major part of his time spent in his office helping students who are having trouble since many of these students will receive the needed help from the CAI system.

D) Presentation of some material which must ordinarily be omitted due to lack of time from the elementary sequence. This could be accomplished through

use of the time expected to be saved in (B) above. Topics which might be added or covered in more depth include alternative measurement systems, economic value, price-level adjustment, decision-orientation, etc.

II. Aid in the "removal" of possible deficiencies of transfers from two-year institutions. The materials developed in this project can be used to help transfer students in two ways:

A) As a medium for accelerated self-help for transfer (and other) students. A student can, before or during enrollment in more advanced courses, use the materials (either the same ones used for the elementary sequence or adaptations) covering topics in which the student or his instructor perceive a weakness in the student's preparation. A more organized use which may be developed in the future would be development of CAI materials to be used in advanced accounting courses to detect weaknesses in any student's preparation and either directly transfer him or refer him to appropriate review modules.

B) As a means for two-year institutions which request the use of the materials to improve their sequences so that deficiencies are "removed" before transfer to a four-year institution. The CAI system (see below) being used has a projected statewide distribution of terminals which includes two-year institutions. (The Chicago City Colleges and other two-year institutions have already indicated an interest in using the materials during testing and for continuing use when development is complete.)

The CAI System (PLATO IV)

The materials being written will be used on the PLATO (Programmed Logic for Automatic Teaching Operations) IV system being developed by the Computer-Based Education Research Laboratory at the University of Illinois at Urbana-Champaign. The new system became available to authors of instructional materials in 1972,

succeeding another system. The PLATO IV system has expanded to more than three hundred terminals, and has potential to operate several thousand terminals simultaneously. In addition plans are already underway to install additional PLATO IV systems in other states. Current evaluation of the system is being accomplished by Educational Testing Service under contract with the National Science Foundation. Measurement of results over the next four years will be accomplished at elementary, secondary, community college and university levels.

To use this system, a student sits in a carrel in front of a keyboard and a display panel approximately eight and one-half inches square. The keyboard is similar in layout to a typewriter keyboard with keys added for special functions. For example the student can press a HELP key to request additional information or aid from the system. The display panel presents high-resolution computer generated material or photographic images projected from a set of 256 available at one time or both simultaneously superimposed on the screen. An optional feature of the system allows input and output of audio material. Although the benefits of this audio feature have not been completely evaluated, current plans do not include the use of it in the accounting materials.

One feature of the system which is used extensively in the accounting materials is provision for the student to enter arithmetic or algebraic expressions as a response to a question. This expression can then be evaluated and the result compared to the correct answer. This feature (not common to CAI systems) allows the student to concentrate on the method of solution rather than getting bogged down by arithmetic and becoming frustrated by arithmetic errors. On PLATO when a student is told a numerical response is incorrect, he can concentrate immediately upon the method of solution used without having to worry about checking his arithmetic.

The CAI lessons are written and stored in TUTOR, a specialized CAI programming language developed for use on the PLATO system. Although large amounts of programming time (approximately 8,000 man-hours for the first semester material) are necessary to produce the instructional material, the programs can be modified easily to improve the presentation of material. In this way the effective parts of the material can be retained while upgrading the weaker parts of the presentation to arrive at a consistently effective and understandable level of instruction throughout each individual lesson.

The Approach

Although it appears feasible in the long run to use the PLATO system to present all the material in the elementary accounting sequence, the general approach of the current project assumes that students have read the relevant material in a textbook (as far as possible, materials avoid dependence on a particular text) and/or listened to a lecture before beginning work on a terminal.[3] Students work "homework" problems on the terminal, receiving aid from sophisticated diagnostic routines.

The problems presented to the students are generally similar to the problems presented in standard texts. The major differences apparent to the students are:

1. Many of the CAI lessons select a different set of random numbers for presentation to each student. In this way each student is encouraged to do his own "homework" since he cannot copy it from his friends. This feature also allows the student to work additional problems in areas in which he feels he is weak.

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[3]Although this was the plan at the beginning of use many students found that some exposure to the related PLATO materials before classroom discussion helped to pinpoint areas of weakness in their understanding of the concepts presented in the text (and on PLATO). These students were then better able to ask specific questions in class with the result that both they and other students received more benefit from the classroom time. (An additional benefit was the use by the PLATO authors of these questions as an additional aid in locating quickly sections of the PLATO material.)

The system will automatically present extra problems to students who were unable to work the regular problem without significant help (e.g., the additional problems presented in remedial sequences).

2. Extensive remedial routines are available to help students, if necessary, to understand the problem and its solution. These routines are of two types. The first and most numerous type of routine is presented after one or more student responses have indicated that the student does not understand a particular area of the problem. The system then presents an explanation of the error the student is making and leads the student to the correct solution (rather than giving him the solution). The second type of remedial routine is presented to those students whose response or responses have indicated that they have a generally weak understanding of the problem. In this case the system presents a detailed review of the concepts involved and in many cases presents the solution to the problem previously presented to the student before asking the student to work another problem of the same type. Although this latter type of remedial routine was not intended to perform original teaching, several people in the university community (with no previous accounting study) who have tried the programs have been able to learn the materials solely through the use of the detailed explanations given in response to their incorrect answers. With this type of help available, there should be no need to cover problems in class. Since the PLATO contact time for each student should be no more than the time required to conscientiously work the problems prior to a conventional presentation in class, the time normally spent presenting problem solutions in class should be saved by both the student and the instructor. (If the instructor would have collected and graded homework in a conventional course, the instructor would also have saved the time required for that activity since the CAI system automatically records time spent, performance, etc., for the instructor's

use). As mentioned above, this time could be used to present additional conceptual material while remaining confident that the students have learned the "mechanics" through their CAI work.

In certain areas (including transaction analysis, closing process, investments, fixed assets from Semester I and cost accounting topics, capital budgeting and funds flow analysis from Semester II) CAI materials are designed to supplant all classroom activity. These areas were selected as those where there is likely to be the greatest ease of CAI presentation relative to classroom presentation. If these lessons are successful, the complete coverage by CAI materials is expected to be expanded to include the entire second semester of the elementary sequence.

Potential Disadvantages

As a possible offset to the advantages of CAI discussed above, in conjunction with project objectives, there are some features of the use of CAI which could reduce the effectiveness of the CAI presentations:

1. All student responses must be entered through the keyboard.[4] This could mean that students who have little or no typing skill could become frustrated by either the length of time required to enter responses or the number of responses which are judged incorrect due to typographical errors. Although the student who is a skilled typist will probably have an initial advantage, an attempt has been made to minimize the typing problem by providing in each lesson for the acceptance of all reasonable abbreviations for key words. Further indication that the typing problem may not be significant has been provided by studies conducted in other disciplines concerning student attitudes toward the use of PLATO III (an experimental

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[4]The PLATO IV system does allow another method of input. A touch panel can be used whereby a student may indicate his response by touching a certain portion of the screen with his fingers or pencil, etc. This feature is not used in the accounting materials since the efficiency of keyboard input is much higher (even for students with little previous typing experience).

predecessor to PLATO IV which had significantly poorer visual presentation). These studies found that, although typing skill was a factor in student adaptation to the system, all but four percent of the students studied were comfortable with the system after four contact hours. The four percent who were still experiencing difficulty after this point generally indicated that they had similar problems in conventional classroom situations. Although these results will not necessarily generalize to accounting, there is no reason to expect a significantly greater problem in the relationship of accounting students to the CAI system.

2. Students will either not have a copy of the problems which they have worked or will have to copy them by hand from the display screen. This problem will be alleviated by allowing students to reenter previous lessons to review by working problems similar to those originally worked. Many instructors feel that this is better review than studying copies of problems previously worked. The PLATO system will provide for complete solution to this problem by making available within a year a system feature which will copy the screen display at specified points, made available by the instructor, in a lesson. The full potential of the addition of this feature is not fully appreciated, but some very effective instructional uses can be visualized. Among these is the possibility of providing a student with an organized copy of his attempts to solve a problem complete with errors and remedial explanations presented by the system.

3. Students will experience limited personal contact with the instructor. While the full psychological effects of student interaction with a computer have not been measured to date, this problem may be overrated simply because the major premise is not necessarily true. That is, there may be at least as much personal contact between student and instructor in a CAI course as would exist in a conventional course (particularly a conventional course taught in large lecture sections). There should be more opportunity for one-to-one or few-to-one relationships

between students and instructor by using the time (student or instructor) saved by use of CAI. Even if less personal relationship with the instructor is available, the student receives individualized CAI in exchange.

Semester I (Financial Accounting) Materials

Testing and Implementation

Materials

Twenty-six lessons were developed for the Semester I material.[5] The average length of time required for a student to complete a lesson varies from 15 minutes to several hours. (Long lessons do not present a particular problem since a student may leave the terminal at any point in a lesson and will be restarted at the same point when he returns.[6]) Each lesson uses system routines to collect data on elapsed time, correct and incorrect responses, and requests for assistance, data or review for each individual student. No standard format of presentation (material or questions) is used. Programs are segmented and indexed to allow the student to review previously studied material at his discretion.[7]

Although the lessons are designed to be as sequence-independent as possible, the first use of them was in a normal sequence as developed in many elementary accounting texts. In early programs, students applied accrual concepts, did transaction analysis leading to making entries to record transactions, adjustments and closing

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[5]One short lesson consists of a special introduction (for accounting students) to the PLATO system.

[6]If a student leaves the terminal in the middle of the development of a specific topic, he will generally be restarted at the beginning of that topic rather than the exact point of departure. Although this may require repetition of several minutes' material, it is generally useful to the student to help orient him to the topic under development. (If the student doesn't need this review, he can usually get past the repeated material in less than two minutes.)

[7]Through examination of the data collected by the system, an instructor may recommend or require that individual students review lessons or parts of lessons.

Information required and presentation format is generally similar to that used for problems and concepts in conventional texts.[8] Students may also use some lessons to develop and organize solutions to problems presented in other media (textbook, handout, etc.). Later programs require the student to prepare statements and bank reconciliations, etc. Although available in all lessons, the provision allowing entry of arithmetic expressions in response to numerical questions is most useful in focussing on the ideas being presented in areas requiring extensive computation (interest, depreciation, etc.)

Instructors familiar with the Semester I course agree that some programs go beyond the material normally presented in the first course. Programs in accrual concepts, inventory methods, investments, and notes and interest are intended to provide greater depth than most elementary courses attempt to achieve. Increased skill is developed in these areas by steps and regular response judging to reinforce progress.

Testing

After testing individual modules during the Spring, 1973 semester and the entire sequence during the Summer, 1973 session, a rigorous test of the effectiveness of the materials was carried out during the Fall, 1973 semester. A Latin-Squares design was developed to test two hypotheses.

> H1) That students can be brought to at least as good a performance level with less class time and significantly less total student time spent on the course using PLATO as compared to conventional teaching.
>
> H2) That students can be brought to a significantly better performance level using PLATO as compared to conventional teaching.

Two instructors, each teaching one control section and one experimental section, were involved in the experiment with students being assigned randomly to control

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[8]More varied presentation and problem types may be developed as time and experience with the medium permits.

or experimental treatment.

Arrangement of Instructors and Elementary Accounting Sections

	Instructor A	Instructor B
10 A.M. Classes	Experimental (N=40)	Control (N=37)
11 A.M. Classes	Control (N=35)	Experimental (N=31)

During the semester, the experimental sections met 18 fewer times for class than the 44 sessions of the control sections. PLATO IV students were given reserved time at certain terminal locations. At all scheduled times, an assistant was present. A surprising proportion of students decided to appear at non-standard times, such as mignight to two in the morning, in preference to reserved daytime hours. During the first half of the semester, system reliability was not perfect, and one failure occurring on the night before an examination caused some complaint from those students who had intended substantial review. Later in the semester, reliability was much improved by the PLATO staff.

To avoid potential bias in their preparation, the examinations were prepared or reviewed by the professor supervising the entire course (who was not involved in the experiment). The exams were de igned to cover a broad range of material without bias to test or control sections. Three examinations and a final exam were administered. The first two exams were of eighty to ninety minute duration and were weighted 50% multiple choice, 10% essay, and 40% problems. In an effort to obtain a better measure of subject area knowledge, the third examination contained no multiple choice questions (which have inherently low discrimination).[9] The final exam was three hours long and more difficult. Time was not as much a

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[9]The multiple choice questions were included on the earlier exams only to reduce the load of grading over 1,000 examinations, not because the professor in charge of the course believes that better measurement can be obtained with these questions.

constraint for the student as on the earlier exams. The components were 7% essay, 27% modified selection, and 66% problems.

Students in the experimental sections had their system time computed automatically. Relatively easy access to the system allowed freedom to spend as much time as the student wished. Students in control sections submitted time of preparation of homework for each of 44 assignments. Times reported by control students did not include review of homework, while review by PLATO students is included within their time measure. Records were kept on the completion of assignments for both test and control subjects.

Examination Results

Scores of the four examinations are tabulated below. No statistical difference was discovered between the experimental and control sections on the first three tests. The final exam was comprehensive and showed a significant difference in favor of the PLATO IV instruction. Separate results are shown for the different class meeting times since it is felt there might be a different population at the different times. Students in the 10 A.M. experimental section received an average of 9 points more on the 182 point final than did the control section. Results of the 11 A.M. final show the experimental section average to be 10 points higher than the control section average. The probability of these differences occurring by chance is less than 1% (using multivariate analysis of variance on the Latin Square design with instructor, meeting time, and individual effects factored out). Note that this significance is achieved despite the apparent bias against the experimental sections shown by the average of the students who missed the final examination.

Test Results

	Exam Means				F Statistic
	10 A.M. Sections		11 A.M. Sections		
	Experimental	Control	Experimental	Control	
Exam 1	80.9%	84.1%	80.2%	80.6%	1.06
Exam 2	65.8	67.8	63.1	66.2	.90
Exam 3	88.5	89.6	85.6	86.4	.25
Final Exam (Comprehensive)	81.2	76.1	76.2	70.7	9.12**
Students Missing from Final	1 prior B	1 prior F	1 prior B 1 prior C	1 prior F	

** Significant at .01 level.

Since the final examination was comprehensive and representative of the material covered in the entire course, the author believes that the hypothesis that the lessons can bring students to higher performance level has been demonstrated by the final examination scores. The statistically insignificant differences on the earlier examinations between experimental and control groups were probably due to the lack of sensitivity of the objective items and the lack of difficulty of the problems on these examinations. Other possible explanations for the divergence of results between the early exams and the final exam include: improved student efficiency in the use of PLATO (i.e., more experience in using a totally new instructional medium improves the benefit to the student); better student attitude due to improved system reliability later in semester, better retention by students using PLATO, and a potential comparative advantage in the use of PLATO to review larger blocks of material.

Analysis of Student Time and Completion of Homework

Data compiled from student homework/terminal time spent during the semester are shown below. Again, figures are presented for each of the class hours included in the experiment. One must recall that the control students did not include review of homework (either immediately after discussion in class or during review for examinations) within the submitted figures. An informal poll showed that the control students did spend a minimum of 20% more time reviewing their homework before examinations. PLATO students' review time is included within the system-measured averages. Students in the 10 A.M. section spent an average of 31 hours on the system, while control students reported an average 41 hours to work on homework assignments. The 11 A.M. section reported 29 and 43 hours, with the experimental section again requiring the lesser time. The probability that such differences could occur by chance is less than .001.

PLATO students also completed a higher proportion of their assigned work than control students. The 10 and 11 A.M. experimental sections completed 20% and 15% more of the assigned work than their counterparts preparing written problems. Thus the PLATO students completed a significantly greater proportion of their assigned work in a significantly smaller time. This result, combined with the equivalent or better exam performance above, strongly supports the first hypothesis. (Students can be brought to at least as good a performance level with less class time and significantly less total student time spent on the course using PLATO as compared to conventional teaching.)

Student Homework Time and Percent Completion

	10 A.M. Sections		11 A.M. Sections		
	Experimental	Control	Experimental	Control	F Statistic
Homework/ Terminal Hours (Average)	31.3	41.2	29.4	42.6	35.59**
Percentage Completion of Assignments	91.4	71.6	85.0	69.8	21.96**

** Significant at .01 level

(In addition, it should be reported that other instructors, with experience teaching similar students in the same course at Illinois, consider the homework time reported by the control students to be much lower than expected. Thus, these student estimates should probably be viewed as conservative.)

Withdrawals

No difference was found in withdrawals from the sections being monitored. This was reassuring, when there are always doubts whether the students will be frustrated by the lessons.

Percentage of Students Receiving Credit

	10 A.M.	11 A.M.	Total
Experimental Retention	92%	89%	90%
Control Retention	90%	89%	89%

Although the overall retention for more than forty elementary accounting sections was only 80%, the writer doesn't consider the Hawthorne effect to be at work. The hours of the experiment are desirable to students and attract high priority students at registration. At the same time, somewhat more experienced instructors were involved in the experiment, and would be expected to retain more students than average.

Semester II Materials

Testing and Implementation

Materials. The general design and organization of the seventeen Semester II lessons are similar to the Semester I approach. The major difference is a more concerted effort toward development of materials which replace all classroom activity for a larger proportion of the subject matter in Semester II. Toward this objective independent materials have been developed covering fund flow analysis, cost accounting, compound interest and capital budgeting, incremental analysis, and some areas of budgeting.

Testing. Although a similar program is planned for testing the Semester II materials, the amount of work involved means that the completion of a controlled experiment will probably not be possible until the Spring, 1975 semester. Currently (Spring, 1974), these materials are being used for the entire course for the first time (analogous to the Summer, 1973 testing of Semester I materials.) Results through the first eight weeks are subjectively judged (by the same instructor) to be at least as good as the Semester I experience at the same point.

Cost

As mentioned in the introduction, the cost of development of this type of material is high. The Semester I materials required approximately 8,000 man-hours of programming while the Semester II materials (partially complete) have already required over 6,000 man-hours. Although the dollar cost related to these figures is hard to compute (most people involved worked many more hours than they were paid for), it is obvious that this level of cost can only be justified when viewed as a fixed cost to be spread over large numbers of students either at one school or a number of co-operating institutions.

The operating costs of the full-scale system can only be estimated at this time.[10] The purchase cost is $5,000 per terminal. Estimated life--8 years, maintenance costs--unknown, usage--minimum 70 hours per week for minimum 40 weeks per year (semester school--probably 44 weeks at quarter school) gives estimated cost per student contact hour of $.22 plus maintenance for terminal alone. Three other types of operating cost must be considered: transmission costs, central processing unit costs, and author royalties (if lesson development costs were not borne by the institution using the lessons). Transmission costs are variable depending upon distance from central processing unit. Current hardware requires one normal telephone line per terminal plus one line per site (group of terminals).[11] For the usage described in this paper, transmission costs will be less than $9 per terminal per month. ($.026 per student hour). At present no charges are being made for central processing unit usage or author royalties. These are expected to total less than $.15 per student hour when charging begins. Thus under the stated assumptions, estimated operating cost would be $.40 per student contact hour. To this must be added maintenance costs, space costs (30 square feet per terminal), and some costs for personnel to supervise the terminals.

In general these personnel need not be much more than caretakers familiar with the rather simple operation of the terminal, but there should be posted hours at which students know that someone better able to help them will be available (similar to and probably no more extensive than office hours.)

Although these cost figures (per student contact hours) compare favorably with those required for conventional instruction (minimum cost for conventional instruction

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[10]The last authoritative estimate published is contained in D. A. Alpert and D. L. Bitzer, "Advances in Computer-based Education," Science, 167, (March 20, 1970), pp. 1582-1590. Several factors (including general price level) have changed significantly since those estimates were prepared.

[11]Additional options are available for large groups of terminals.

in these courses at the University of Illinois at Urbana-Champaign exceeds $1.35 per student contact hour), it must be remembered that PLATO contact hours do not necessarily replace classroom contact hours on a one-for-one basis. In particular for the Semester I tests, since the student works with PLATO on tasks that he would normally perform outside of class, thirty hours of PLATO contact time replaced 18 hours of classroom contact time (and a greater amount of homework time.)[12] On balance, these considerations indicate that there are probably cost savings available through large-scale use of PLATO is the elementary accounting sequence, but they cannot be accurately projected at this point.

Plans for the Future

Although only 80 students used PLATO for the Semester I course in the experiment reported above, the Semester I materials are viewed as operational for as many students as can be accommodated on terminals. In addition, over 60 students are using these materials on a self-paced basis during the Spring, 1974 semester. These students are given schedules showing textbook material to be read and PLATO lessons to be completed before taking a particular exam.[13] After two required meetings at the beginning, classroom contact is limited to one voluntary hour per week where the students can discuss their areas of concern.

Each student takes his exam when he decides he is ready. The exams are partially administered on PLATO, partially on paper and are designed so that knowledge of exams taken earlier by other students gives little, if any, help to those students who take the exam later. Although there is no control group (conventional

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[12]The ratio of PLATO contact hours to classroom contact hours replaced is probably highly variable depending on quality of student, quality of materials, organization and method of use of PLATO in course, etc. and can probably be reduced through experience particularly in manipulation of the method of integration of PLATO with classroom work.

[13]They are told that they must take the exam before a certain date so they don't fall too far behind a rate which will allow them to complete the course in one semester.

teaching is not self-paced so no rigorous comparison can be made, the instructor involved feels that the students' performance is comparable to that which he would expect with conventional teaching with instructor time substantially reduced.

In addition to the testing and implementation of the Semester II materials (discussed above), other areas which should receive attention in the near future relate to the second main objective of the project: "removal" of deficiencies of transfer students. PLATO terminals are currently being installed at four sites within the City Colleges of Chicago. The accounting materials will be used (on a test basis at least) at three of these sites. Contacts with several other institutions have already been established concerning this type of use. In addition faculty on this campus are pressing for terminal access for students in intermediate financial or managerial accounting courses to have access to these materials as remedial modules.

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